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Predaceous Mites of the Genus *Agistemus* in Japan (Acarina: Stigmaeidae)*

With 7 Text-figures

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(Communicated by T. UCHIDA)

Mites belonging to the genus *Agistemus* are known to feed usually on phytophagous mites or scale insects. Recently, two species of this genus were recognized to occur in Japan (Ehara, 1962; González-Rodríguez, 1963). The present paper is concerned with the two known and two new species of the genus. The four Japanese species are so similar that it is rather troublesome to distinguish them. The descriptive terms used below are mostly those of Summers (1960), and partly of González-Rodríguez (1963).

KEY TO JAPANESE SPECIES OF *Agistemus*

Females

1. Dorsal plates very finely striated; no humeral plates; postoculars *ce* at least twice as long as humerals *he*. *summersi* n. sp.
Dorsal plates not striated; humeral plates present; postoculars *ce* slightly longer than, or as long as humerals *he*. 2
2. Preoculars *be* approximately as long as distance between *be* and *ce*; *ce* approximately as long as *he*. *terminalis* (Quayle)
Preoculars *be* much longer than distance between *be* and *ce*; *ce* longer than *he* 3
3. Dorsocentrals *a* as long as, or slightly shorter than, distance between setae of this pair; paragenitals *pg*₁ shorter than distance *pg*₁ to *pg*₂; *ag*₁ longest of anogenitals.. *lobatus* n. sp.
Dorsocentrals *a* noticeably longer than distance between setae of this pair; paragenitals *pg*₁ approximately as long as distance *pg*₁ to *pg*₂; anogenitals *ag*₁, *ag*₂, *ag*₃ subequal in length *exsertus* González-Rodríguez

Males

(Males of *terminalis* are unknown.)

1. Setae *lm* and *c* similar in length, shorter than all other setae on metapodosomal plate; femur IV with one seta. *summersi* n. sp.
Setae *b* and *c* similar in length, shorter than all other setae on metapodosomal plate;

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- femur IV with two setae.....2
2. Dorsocentrals *a* shorter than distance between setae of this pair; postoculars *ce* very slightly shorter than distance between setae *be* and *ce* *lobatus* n. sp.
- Dorsocentrals *a* longer than distance between setae of this pair; postoculars *ce* more or less longer than distance between setae *be* and *ce*....*exsertus* González-Rodríguez

Agistemus summersi n. sp. (Figs. 1, 2)

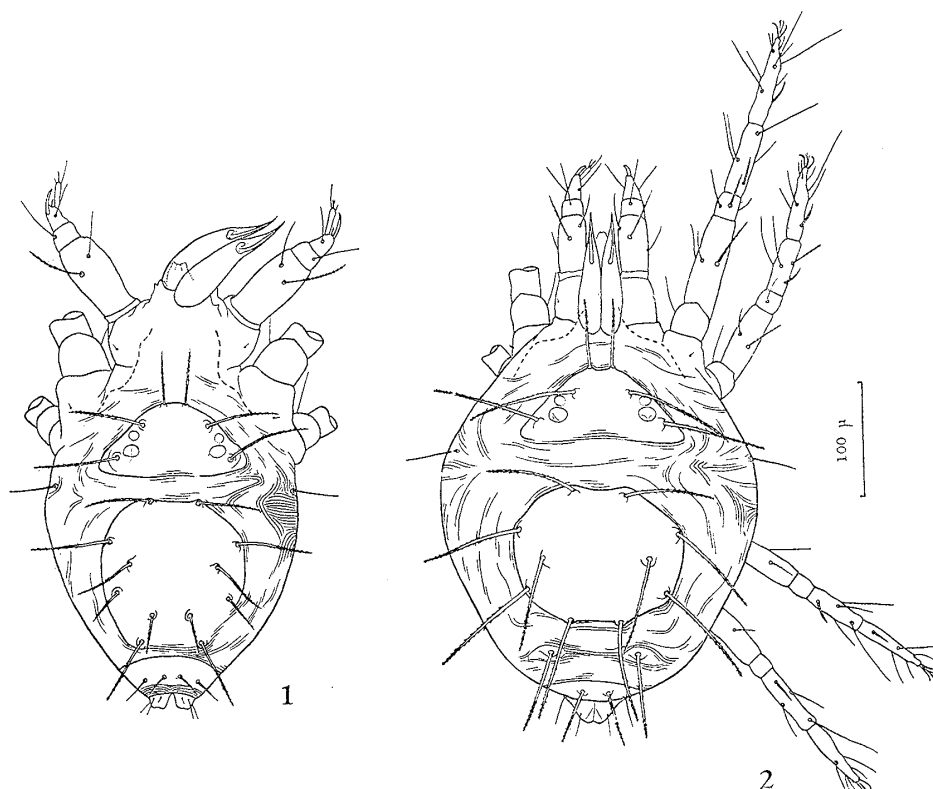
(Jap. Name: Ezo-nagahishidani)

Female. Pale orange in colour. Dorsal plates very finely striated; propodosomal and metapodosomal plates widely separated; no humeral plates; intercalary plates not well defined. Postocular bodies small (15 μ long), elliptical. Dorsal setae of idiosoma stout, pectinate, set on strong tubercles. Relative lengths of dorsal setae: $be = ce = c = la = lm \geq a = b \geq li > ae > he = e > le$. Length of vertical setae *ae* approximately three times as long as distance between individuals of this pair; preoculars *be* approximately twice as long as distance between *be* and *ce*; postoculars *ce* at least twice as long as *he*; dorsocentrals *a* much longer than distance *a* to *b*, ratio length/distance between bases of pair $a = 1.7$; *b* slightly closer to *la* than to *lm*. Two pairs of paragenitals on venter of opisthosoma, *pg*₁ and *pg*₂ subequal in length, approximately as long as distance *pg*₁ to *pg*₂; anogenitals* *ag*₃ and *ag*₄ broader than *ag*₁ and *ag*₂; distance between *ag*₁ and *ag*₂ usually much longer than distance *ag*₂ - *ag*₃. Tip of palpus extending forward to genu-tibial joint of leg I; palpfemur with stout, conspicuously barbed seta dorsally. The following dorsal setae on legs are stout and prominently barbed: one seta on femora I and II each, one on genua I and II each; tibia II with conspicuously barbed seta dorsolaterally. Average measurements in micra (n=8): body length (including rostrum) 420; body width (at widest part) 250; leg I (excluding coxa and claws) 260; stylet length 46; setae *ae* 58, *be* 93, *ce* 93, *he* 44, *a* 78, *b* 81, *c* 93, *la* 87, *lm* 96, *li* 70, *e* 46, *le* 27, *pg*₁ 17, *pg*₂ 18, *ag*₁ 21, *ag*₂ 18, *ag*₃ 18; distances *ae*-*ae* 21, *ae*-*be* 24, *be*-*ce* 44, *a*-*a* 46, *b*-*b* 90, *c*-*c* 44, *li*-*li* 64, *a*-*b* 64, *b*-*c* 64, *b*-*la* 29, *b*-*lm* 38, *pg*₁-*pg*₂ 18, *ag*₁-*ag*₂ 13, *ag*₂-*ag*₃ 9.

Male. Dorsal plates arranged as illustrated, very finely striated; humeral plates absent. Postocular bodies similar to those of female. Relative lengths of dorsal setae: $be = ce = la > ae = a = b = li > he = c = lm > le > e$. Length of vertical setae *ae* approximately twice as long as distance between members of this pair; preoculars *be* about twice as long as distance *be* to *ce*; postoculars *ce* one and a half times to twice as long as *he*; dorsocentrals *a* about as long as distance *a* to *b*. Tip of palpus surpassing genu-tibial joint of leg I; palpfemur with stout, conspicuously barbed seta dorsally. Femora I and II each and genu I with stout, conspicuously barbed seta dorsally; femur III with two setae; femur IV lacking dorsal seta. Average measurements in micra (n=3): body length 360; body width 170; leg I 290; stylet length 46; setae *ae* 49, *be* 73, *ce* 67, *he* 38, *a* 52, *b* 49, *c* 29, *la* 64, *lm* 35, *li* 52, *e* 17, *le* 21; distances *ae*-*ae* 24, *ae*-*be* 23, *be*-*ce* 38, *a*-*a* 46, *b*-*b* 73, *c*-*c* 35, *li*-*li* 46, *a*-*b* 49, *b*-*c* 44, *b*-*la* 24, *b*-*lm* 27.

* The foremost pair of anogenital setae is labelled *ag*₁; the remainder is labelled consecutively *ag*₂, *ag*₃ and *ag*₄.

Types. Holotype: ♀, Sapporo, Hokkaido, 22-VIII-1963 (on sasa bamboo), S. Ehara leg. Allotype: ♂, same data as holotype. Paratypes: 14 ♀♀ and 2 ♂♂, same data as holotype. The types are preserved in the Zoological Institute, Faculty of Science, Hokkaido University. A few specimens taken on sasa bamboo in Hirosaki (Aomori Pref.) tentatively identified with *A. fleschneri* Summers in a previous paper (Ehara, 1962), are now referred to this new species.



Figs. 1, 2. *Agistemus summersi* n. sp. 1, dorsum of male. 2, dorsum of female.

Distribution. Japan (Hokkaido and Honshu).

Remarks. *A. summersi* is characterized by the minutely striated dorsal plates, absence of humeral plates, and the very long dorsal setae. The male of *summersi* is unique in having only one seta on femur IV. Females of this species resemble those of *A. longisetus* González-Rodríguez, 1963, but differ from the latter in the widely separated, main dorsal plates, and in absence of humeral plates. Further, the ratio of length/distance between bases of pair *a* is 1.7 in the former while ca. 3 in the latter. The males of *A. africanus* (Meyer and Ryke, 1960) may be similar to those of *summersi*, but are provided with two setae on femur IV.

This species is named in honour of Dr. Francis M. Summers.

Agistemus exsertus González-Rodríguez (Figs. 3, 4)

(Jap. Name: Kobumochi-nagahishidani)

Agistemus exsertus González-Rodríguez, 1963, p. 343, Figs. 1, 2.

Agistemus fleschneri (nec Summers), Ehara, 1962, p. 56, Figs. 12-14.

Female. Dark red in colour. Dorsal plates well defined, neither reticulated nor striated; propodosomal and metapodosomal plates widely separated; humeral plates present. Postocular body large ($32\ \mu$ long), usually accompanied by a smaller, elongate accessory body mesially. Dorsal setae stout, pectinate, set on tubercles. Relative lengths of dorsal setae: $be > ce = a = b = c = la = lm = li > ae = he > e > le$. Ratio of length/distance between bases of pair $ae = 1.7$; preocular setae be much longer than distance be to ce ; postoculars ce longer than he ; dorsocentrals a slightly longer to slightly shorter than distance a to b , ratio of length/distance between bases of setae $a = 1.7$; b remarkably closer to la than to lm . Two pairs of paragenitals on venter of opisthosoma, pg_1 slightly longer than pg_2 , approximately as long as distance pg_1 to pg_2 ; anogenitals successively increasing in thickness from ag_1 to ag_4 ; ag_1 , ag_2 , ag_3 similar in length, distance ag_1 to ag_2 longer than distance ag_2 to ag_3 . Tip of palpus surpassing genu-tibial joint of leg I; palpfemur with stout, strongly barbed seta dorsally. Femora I and II each with stout, prominently barbed seta; genua I and II each with such seta; tibia II with relatively prominently barbed seta laterally. Average measurements in micra ($n=8$): body length 410; body width 260; leg I 220; stylet length 38; setae ae 49, be 81, ce 64, he 46, a 64, b 64, c 67, la 64, lm 67, li 64, e 32, le 21, pg_1 17, pg_2 14, ag_1 17, ag_2 14, ag_3 17; distances ae - ae 29, ae - be 26, be - ce 58, a - a 38, b - b 96, c - c 44, li - li 70, a - b 58, b - c 61, b - la 19, b - lm 41, pg_1 - pg_2 15, ag_1 - ag_2 11, ag_2 - ag_3 6.

Male. Propodosomal and metapodosomal plates widely separated; humeral plates present; intercalary plates jointed as usual to metapodosomal plate. Postocular bodies similar to those of female. Relative lengths of dorsal setae: $be = ce > ae = he = a = la = lm = li > b > c > e = le$. Ratio of length/distance between bases of pair $ae = 1.6$; preoculars be more or less longer than distance be - ce ; postoculars ce longer than he ; dorsocentrals a as long as, or slightly longer than distance a - b , distance between setae of pair a shorter than one seta of this pair. Tip of palpus lateral to tibia I; palpfemur with stout, conspicuously barbed seta. The leg chaetotaxy is similar to that of female, except addition of solenidion on tarsi I and II each; femora III and IV each with two setae. Average measurements in micra ($n=4$): body length 340; body width 200; leg I 230; stylet length 35; setae ae 41, be 55, ce 55, he 38, a 44, b 28, c 22, la 44, lm 44, li 46, e 15, le 15; distances ae - ae 26, ae - be 21, be - ce 44, a - a 32, b - b 75, c - c 35, li - li 44, a - b 41, b - c 41, b - la 15, b - lm 25.

Specimens examined. Specimens from Honshu (on citrus and tea) and Kyushu (on citrus) were available for this study.

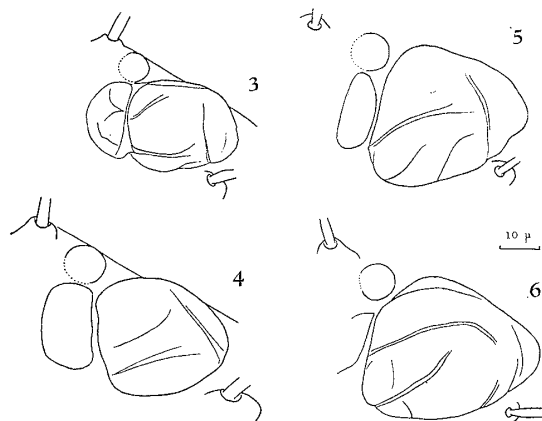
Distribution. Japan (Honshu and Kyushu) and India.

Remarks. The postocular bodies of *A. exsertus*, along with the accessory bodies, are variable individually (Figs. 3, 4; see also Fig. 12 of Ehara, 1962, and Fig. 1 of González-Rodríguez, 1963). This mite is actively predaceous upon *Panonychus citri* (McGregor) on citrus and upon *Tetranychus kanzawai* Kishida on tea.

Agistemus lobatus n. sp. (Figs. 5-7)

(Jap. Name: Kita-nagahishidani)

Female. Brownish red in colour. Dorsal plates well defined, neither striated nor reticulated; propodosomal plate widely separated from metapodosomal plate; humeral plates present.



Figs. 3-6. Postocular bodies. (♀). 3, 4, *Agistemus exsertus*. 5, 6, *Agistemus lobatus* n. sp.

Postocular body large (41 μ long), lobular, variable in shape, accompanied by an elongate, inconspicuous accessory body mesially; the latter frequently reduced to only a fold. Dorsal setae pectinate, set on small tubercles. Relative lengths of dorsal setae: $be > ce = a = b = c = la = lm = li \geq ae \geq he > e > le$. Ratio of length/distance between bases of verticals $ae = 1.8$; preoculars be longer than distance be to ce ; postoculars ce more or less longer than he ; dorsocentrals a

slightly shorter than distance a to b , distance between bases of pair a as long as, or slightly longer than one seta of this pair; b noticeably closer to la than to lm . Two pairs of paragenitals on venter of opisthosoma, pg_1 as long as pg_2 , shorter than distance pg_1 to pg_2 ; anogenitals successively increasing in thickness from ag_1 to ag_4 ; ag_1 longest of anogenitals, distance ag_1 - ag_2 as long as, or slightly longer than distance ag_2 - ag_3 . Tip of palpus reaching distal part of tibia of leg I, sometimes extending to tibio-tarsal joint; palpfemur with stout dorsal seta. Femora I and II each and genu I with stout, conspicuously barbed seta. Average measurements in micra ($n=5$): body length 380; body width 250; leg I 230; stylet length 41; setae ae 46, be 70, ce 52, he 41, a 52, b 52, c 52, la 52, lm 58, li 55, e 32, le 23, pg_1 17, pg_2 17, ag_1 21, ag_2 15, ag_3 15; distances ae - ae 26, ae - be 24, be - ce 58, a - a 55, b - b 100, c - c 49, li - li 70, a - b 61, b - c 58, b - la 19, b - lm 35, pg_1 - pg_2 21, ag_1 - ag_2 10, ag_2 - ag_3 8.

Male. Propodosomal and metapodosomal plates widely separated; humeral plates present; intercalary plates jointed as usual to metapodosomal plate. Postocular bodies similar to those of female. Relative lengths of dorsal idiosomal setae: $be > ae = ce = he = a = la = lm = li > b > c > e = le$. Ratio length/distance between bases of verticals $ae = 1.5$; preoculars be longer than distance between be and ce ; postoculars ce slightly longer than he ; dorsocentrals a approximately as long as distance a - b , distance between bases of a longer than seta of pair a . Tip of palpus more or less lateral to genu-tibial joint of leg I; palpfemur with stout dorsal seta. The leg chaetotaxy is similar to that of female, except addition of solenidium on tarsi I and II each; femora III and IV each with one dorsal and one ventral setae. Average measurements in micra ($n=3$): body length 290; body width 180; leg I 190; stylet length 32; setae ae 38, be 52, ce 41, he 38, a 35, b 26, c 19, la 38, lm 35, li 38, e 15, le 17; distances ae - ae 26, ae - be 19,

be-ce 46, *a-a* 46, *b-b* 67, *c-c* 38, *li-li* 44, *a-b* 41, *b-c* 32, *b-la* 15, *b-lm* 21.

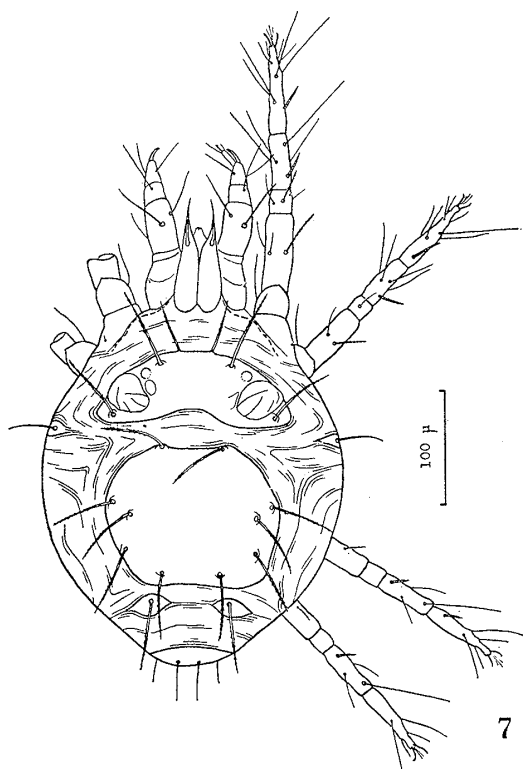


Fig. 7. *Agistemus lobatus* n. sp., dorsum of female.

Types. Holotype: ♀, Kuroishi, Aomori Pref., 9-III-1963 (on apple), M. Yamada leg. Allotype: ♂, Kuroishi, 18-IX-1959 (on apple), C. Tsugawa leg. Paratypes: 7 ♀♀, Kuroishi, 9-III-1963 (on apple), M. Yamada leg.; 8 ♀♀ and 8 ♂♂, Kuroishi, 18-IX-1959 (on apple), C. Tsugawa leg. The types are placed in the Zoological Institute, Faculty of Science, Hokkaido University. Additional specimens (♀♀ and ♂♂) were studied from Fukushima Prefecture (Iizaka, 5-X-1955, on apple, N. Hikichi leg.).

Distribution. Japan (Honshu).

Remarks. *A. lobatus* closely resembles *exsertus*, but females of the two species are different in the foremost dorsocentral setae, and in paragenital and anogenital setae. The males may be also distinguished by the foremost pair of dorsocentral setae. *A. africanus* (Meyer and Ryke, 1960) appears to be similar to *lobatus*, but males differ in the relative lengths

of preoculars *be* and distance between *be* and *ce*.

Agistemus terminalis (Quayle)

(Jap. Name: Keboso-nagahishidani)

Caligonius terminalis Banks: Quayle, 1912, p. 499, Fig. 10.

Agistemus terminalis, Summers, 1960, p. 234, Fig. 1, right, Figs. 2, 3; Ehara, 1962, p. 58, Fig. 15.

Female. Dark red in colour. Dorsal plates well defined, without reticulation or striation; propodosomal and metapodosomal plates widely separated; humeral plates present. Postocular bodies large, variable in size (30 to 36 μ long). Dorsal setae short and slender, pectinate, not set on prominent tubercles; preoculars *be* the longest, other dorsal setae more or less similar in length; length of verticals *ae* slightly shorter than distance between setae of this pair; preoculars *be* subequal in length to distance *be* to *ce*; dorsocentrals *a* much shorter than distance *a* to *b*, distance between setae of pair *a* noticeably longer than seta of this pair; *b* much closer to *la* than to *lm*. Two pairs of paragenital setae present, *pg*₁ subequal in length to *pg*₂, as long as distance *pg*₁ to *pg*₂; anogenitals *ag*₁ ultralong, *ag*₃ and *ag*₄ wider than *ag*₁ and *ag*₂, distance *ag*₁ to *ag*₂ more or less longer than distance *ag*₂ to *ag*₃. Tip of palpus at least reaching tibio-tarsal joint of leg I; palpfemur with dorsal seta strongly barbed. Femora I and II each with stout, strongly barbed seta dorsally; genu

I with such seta dorsally, Average measurements in micra ($n=5$): body length 430; body width 260; leg I 200; stylet length 44; setae *ae* 35, *be* 49, *ce* 41, *he* 44, *a* 35, *b* 35, *c* 38, *la* 35, *lm* 41, *li* 41, *e* 35, *le* 32, *pg*₁ 18, *pg*₂ 20, *ag*₁ 32, *ag*₂ 20, *ag*₃ 17; distances *ae-ae* 41, *ae-be* 28, *be-ce* 49, *a-a* 58, *b-b* 100, *c-c* 49, *li-li* 70, *a-b* 58, *b-c* 61, *b-la* 19, *b-lm* 38, *pg*₁-*pg*₂ 18, *ag*₁-*ag*₂ 11, *ag*₂-*ag*₃ 9.

Male. Unknown.

Specimens examined. Females from Honshu, Shikoku and Kyushu were studied. New material (♀ ♀) is from Shikoku and Kyushu: Matsuyama, Ehime Pref., 13-VII-1962 (on citrus), S. Mori leg.; Yawatahama, Ehime Pref., 15-V-1962 (on citrus), S. Mori leg.; Kurume, Fukuoka Pref., 12-VII-1963 (on citrus), K. Inoue leg.

Distribution. Japan (Honshu, Shikoku*, Kyushu*), North and Central America.

Remarks. In Japan *A. terminalis* is usually found on citrus, preying on *Panonychus citri* (McGregor), eriophyids, and scale insects such as *Unaspis yanonensis* (Kuwana).

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* New locality record.